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Studies on the Rocky Mountain Flora.—I*

BY P. A. RYDBERG

(WITH PLATES 5 AND 6.)

SPECIES OF SENECIO OF THE LOBATUS, AUREUS, SUBNUDUS AND TOMENTOSUS GROUPS

It may seem strange that I present here a paper on SENECIO, when it is well known to me that Mr. Greenman is occupied in preparing a monograph of the genus in all North America, from the arctic regions to the Isthmus. My work was begun a year ago, and before I knew of Mr. Greenman's work. I have not been able to present my results in print before now, and I do it with the good will of the gentleman mentioned, and with the understanding that I confine myself to the Rocky Mountain region.

The four groups treated here are closely related and grade into each other. They might have been treated as a single group but even this would have been more or less artificial and ill-defined, because there are several intergradations with related groups. The more foliose species of the AUREI as *S. platylobus* and *S. Idahoensis* described below connect with the EREMOPHILI; *S. cymbalarioides* with the ALPICOLAE, and *S. canovirens* with the CANI.

The work presented here is based on my own studies in the field and the specimens found in the herbaria of the New York Botanical Garden, Columbia University and College of Pharmacy, all in New York City.

LOBATI

Annuals or biennials or perennials with a taproot, perfectly glabrous in age or slightly floccose at the bases of the leaves, more or less leafy throughout, 3 dm. or more high: leaves, all except the very first, pinnately divided: heads rather small and minutely calyculate. In habit resembling the AUREI and TOMENTOSI, to which the last two form a transition, but have more divided leaves and a root of less duration.

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*The author intends to publish under this title a series of papers on the Botany of the Rocky Mountain Region. The intention is not however to limit these studies to the botany of the mountains proper, but will include also the Great Plains to the eastward. They will comprise the following states and territories: eastern British Columbia, Alberta. Saskatchewan, Assiniboia, Montana, Idaho, Wyoming, Colorado, New Mexico, eastern Utah, and the extreme western portions of the Dakotas, of Nebraska, Kansas, Oklahoma and Texas.

- Leaves thin; root annual or biennial.
  - Head about 1 cm. high; terminal segments of the basal leaves 3–5 cm. wide. 1. *S. sanguisorboides.*
  - Head 5–8 mm. high; terminal segments of the basal leaves less than 2 cm. wide.
    - Basal leaves with few segments; segments crenate or dentate. 2. *S. Greggii.*
    - Basal leaves with numerous segments; segments lobed or cleft. 3. *S. millelobatus.*
- Leaves rather thick; root perennial.
  - Bracts thick, much shorter than the disk. 4. *S. multilobatus.*
  - Bracts thin, almost equaling the disk. 5. *S. Nelsonii.*

1. **Senecio sanguisorboides** sp. nov.

Tall and simple, perfectly glabrous, annual or maybe biennial: stem terete, about 6 dm. high, leafy: basal leaves thin, 1–2 dm. long, petioled, pinnately divided with 3–5 segments; terminal segments reniform, 3–5 cm. wide, coarsely crenate; lateral segments almost orbicular, crenate: lower stem leaves similar; the upper with 7–11 segments, short-petioled or the uppermost subsessile; the base of the petioles with large round, laciniate auricles; terminal segment ovate, incised-crenate; the lateral ones obovate or broadly cuneate: cyme rather contracted: heads about 1 cm. high; bracts 12–16, linear-lanceolate, acute, about 1 mm. wide, with membranous margins; the calyculate ones very few and minute, lanceolate: rays about 10, 8 mm. long and 3 mm. wide, about 4-nerved: achenes glabrous and angled.

This has been referred to *S. Sanguisorbae* DC.; but a comparison with De Candolle's description shows several discrepancies. According to the description S. *Sanguisorbae* should have only 8–10 bracts and 5 rays, the leaves should be puberulent beneath and the terminal segment orbicular, characters not found in the present species. The latter grows at an altitude of 2500–3000 m. [Plate 5, f. 14.]

NEW MEXICO: Santa Fe Cañon, 1897, *A. A. & E. Gertrude Heller, 3820* (type in the herbarium of the N. Y. Botanical Garden); White Mountains, 1897, *E. O. Wooton, 494.*

2. **Senecio Greggii** sp. nov.

Senecio Tampicanus A. Gray, Pl. Fendl. 109. 1849; not DC., 1837; *S. lobatus* A. Gray, Pl. Wright. **2**: 99. 1852; not Pers. 1807.

Biennial or annual, with several stems from the base, perfectly glabrous in age: stems about 3 dm. high: leaves pinnately divided or the very first ones simple: basal leaves with 3–5 segments, the terminal one round and crenate, about 1 cm. in diameter; the lateral ones small, obovate; stem leaves with 7–9 small segments and more or less auricled at the base of the very short petiole: cyme compound: heads rather many, only 5–7 mm. high; bracts about 20, linear-acuminate; the calyculate ones minute and few: rays 8–10, about 3 mm. long and 1.5 mm. wide, 3-nerved: achenes angled and strigose.

This is nearest related to *S. lobatus* but smaller and characterized by the many stems from the same root, the few segments of the basal leaves, the small heads and the narrow bracts. Only Wright's specimens were collected in the region here treated. [Plate 5, f. 8.]

MEXICO: Santa Rosalia, *Dr. Gregg* (type in Torrey Herbarium).

TEXAS: Near El Paso, 1851–2, *C. Wright, 1413;* between Frio and Nueces Rivers, 1880, *E. Palmer, 754;* Loredo to Frontera, *Wright* (Mexican Boundery Survey), *659,* in part.

3. **Senecio millelobatus** sp. nov.

Senecio Tampicanus A. Gray, Pl. Wright. **2**: 99. 1852; not DC. 1837; *S. multilobatus* A. Gray, Syn. Fl. $\mathbf{1}^2$: 394, in part. 1884; not T. & G. 1849.

Annual or biennial, perfectly glabrous or slightly floccose at the base of the leaves: stem branched, 3–5 dm. high, very leafy: all leaves pinnately divided, 3–7 cm. long, lanceolate or oblanceolate in outline; segments 13–23, obovate, 3–10 mm. long, lobed or cleft into oblong or ovate lobes; the upper segments more or less confluent: cyme compound: heads about 8 mm. high; bracts oblong-lanceolate, acuminate, 12–15 in number; calyculate ones minute and few: rays 5–8 mm. long and 1.5–2 mm. wide: achenes very scabrous on the angles.

This is nearest related to the preceding and to *S. lobatus* but is easily distinguished by the numerous and lobed or cleft segments. It may be related to *S. Tampicanus* which I have not seen, but that species is described as having only 4 or 5 pairs of segments and glabrous achenes. [Plate 5, f. 11.]

NEW MEXICO: Hills on the Limpia, 1851–2, *C. Wright, 1287* (type in the Torrey herbarium); *P. V. Le Roy.*

TEXAS: Lower Rio Grande, 1852, *Parry* (Mexican Boundary Survey), *658*.

4. SENECIO MULTILOBATUS Torr. & Gray; Gray, Pl. Fend. 109. 1849

The type of this species is in the Torrey herbarium and very unlike the plant regarded by Gray as *S. multilobatus*. It is characterized by its fleshy leaves and stands perhaps nearer to *S. compactus* than to the group with which it was associated by Dr. Gray. I have placed it in this group on account of its pinnatifid basal leaves. The earliest of these are, however, entire, in the same manner as they occasionally are in *S. rosulatus*. This analogy and the close relationship to *S. compactus* undoubtedly made Prof. Greene name Baker, Earle and Tracy's specimens "*Senecio compactus* Rydb., verging towards *S. Fendleri*." These specimens differ from Fremont's plant only in the fact that the basal leaves are shorter and less divided. Eastwood's specimens are exactly like the type. The base of these specimens shows that the plant is a perennial rather than an annual as stated in the original description. It grows at an altitude of about 2000 m. [Plate 6, f. 11.]

UTAH: Uintah River (a tributary of Greene River), *Fremont*, *549* (type in the Torrey herbarium); Ogden, 1871, *Hayden Survey;* South Utah, *J. E. Johnson*.

COLORADO: Grand Junction, 1892, *A. Eastwood;* Mancos, 1898, *Baker, Earle & Tracy, 446;* Dolores, 1892, *C. S. Crandall;* South Park, 1871, *W. M. Canby*.

5. SENECIO NELSONII Rydb. Bull. Torr. Club, **24**: 483. 1899

Prof. Greene in Pittonia, **4**: 112, devotes over a page to this species, claiming it to be the same as *S. Fendleri*, and criticises both Prof. Nelson and myself. We had, however, both investigated the matter thoroughly before the species was published. In claiming that the two species are the same, Prof. Greene must either not know one of the plants or both, or else do it for the purposes of finding fault. *S. Nelsonii* has the leaf form of *S. Fendleri*, but there ends the similarity. In the former the caudex is short, not woody, and with numerous fibrous roots, placing it nearer to *S. multilobatus* and *S. compactus*, while *S. Fendleri* has a very thick and woody rootstock. The heads of *S. Nelsonii* are larger, 8–10 mm. high, and the bracts are thin and in anthesis almost equal the disk, while in *S. Fendleri* they are thick and much shorter. The former also lacks the fine tomentum of the latter; it is merely floccose when young in the manner of *S. multilobatus* and *S. compactus*. *S. Nelsonii* is dark green while *S. Fendleri* is more or less yellowish. Neither of the species forms mats, as Prof. Greene states. Heller's specimens, from the type locality of *S. Fendleri*, agree fully with Gray's description of that species, except that they are more glabrate than the type. They represent a plant of several season's growth, but show nothing to indicate a matted plant. I think that Prof. Greene has here confused *S. rosulatus* with the two. Prof. Greene's conception of *S. Fendleri* must be very comprehensive, indeed, as he also includes in that such forms as *S. subcuneatus*, *S. canovirens*, and another species, nearly related to *S. fastigiatus* Nutt. This statement is founded on specimens determined by Prof. Greene only a year or two ago and found in the herbarium of the New York Botanical Garden. By comparing Plate 5, Fig. 6, and Plate 6, Figs. 1, 3, 4 and 9, with each other, one can get an idea of Prof. Greene's conception of *S. Fendleri*.

I have seen no specimens of *S. Nelsonii* except the type.

AUREI

Slender perennials, over 2 dm. high, with a short erect caudex or rootstalk, glabrous or slightly floccose when young, the wool remaining in age only at the base of the leaves: basal leaves entire, merely toothed: stem leaves more or less pinnatifid and the upper more or less reduced: heads small, cymose, with very small and few calyculate bracts.

Heads radiate.
Leaves thick, more or less fleshy.
Basal leaves narrowly oblanceolate.
Plant low, less than 2 dm. high, often with several stems from the base; basal leaves short-petioled.
Cyme dense; upper leaves generally pinnatifid with narrow lobes. 6. *S. compactus.*
Cyme more open; stem leaves entire or merely crenate.
Basal leaves subentire or 3-toothed at the apex. 7. *S. tridenticulatus.*
Basal leaves crenate. 8. *S. oblanceolatus.*

Plant about 4–6 dm. high, simple.

Leaves serrate or subentire ; basal leaves 1 cm. or more, slender-petioled. 9. *S. longipetiolatus.*

Stem leaves with long, triangular lobes ; basal leaves 5 cm. or less. 10. *S. fulgens.*

Basal leaves cuneate, spatulate or broadly oblanceolate, subentire at the base.

Lower stem leaves spatulate with a broad-winged petiole ; upper ones sessile and with much enlarged bases. 11. *S. crocatus.*

Stem leaves neither broad-winged nor with much enlarged bases.

Basal leaves crenate above the middle. 12. *S. cymbalarioides.*

Basal leaves angularly dentate. 13. *S. Jonesii.*

Basal leaves sharply dentate or serrate above the middle.

Lower stem leaves cuneate, plant 3–4 dm. high. 14. *S. subcuneatus.*

Lower stem leaves oblanceolate ; plant about 2 dm. high. 15. *S. acutidens.*

Leaves thin.

Basal leaves ovate or more commonly cordate, serrate. 16. *S. pseudaureus.*

Basal leaves obovate or oval, crenate or sinuate-dentate.

Stem leaves ovate in outline, with broad segments. 17. *S. platylobus.*

Stem leaves lanceolate or oblanceolate in outline, with narrow segments. 18. *S. flavovirens.*

Stem leaves spatulate or oblanceolate in outline, with short and broad segments. 19. *S. aurellus.*

Head discoid.

First basal leaves reniform. 20. *S. nephrophyllus.*

None of the leaves reniform.

Plant stout ; stem leaves with broad laciniate segments. 21. *S. Idahoensis.*

Plant slender ; stem leaves with narrow segments.

Plant yellowish or light green ; bracts not purple-tinged. 17. *S. flavovirens.*

Plant dark green.

Basal leaves crenate ; head 8–10 mm. high ; bracts purple-tinged, linear. 22. *S. pauciflorus.*

Basal leaves wavy ; heads about 6 mm. high ; bracts broadly lanceolate or oblong, not purple-tinged. 23. *S. fedifolius.*

6. SENECIO COMPACTUS (A. Gray) Rydb. Mem. Torr. Club, 5: 342. 1893

Senecio aureus var. *compactus* A. Gray, Syn. Fl. 1^2 : 391. 1884.

Dr. Gray's description covers two if not three species. For which of these *S. compatus* should be used is a matter of question. I have adopted it for the plant of the plains with a dense cyme and usually pinnatifid-dentate stem leaves. Dr. Gray evidently had this plant in mind when he adopted the name *com-*

pactus. The description seems to indicate mostly this species, which also I had in mind when I raised the variety to specific rank and it is this that is described and figured in Britton and Brown's Illustrated Flora. On the other hand if synonomy and the citation of specimens are taken in consideration, the name may have been applied to the next, for the first synonym and the first specimen cited belong to that species. [Plate 5, f. 15.]

NEBRASKA: Valentine, *J. M. Bates, 34;* Lewellen, *G. D. Sweezey, 82;* Fort Niobrara, 1888, *T. E. Wilcox;* Thedford, 1893, *P. A. Rydberg, 1311;* Platte Bottom, 1891, *211.*

COLORADO: Plains, 1882, *Allen & Brewster;* Colorado Springs, 1892, *Isabel Mulford.*

7. **Senecio tridenticulatus** sp. nov.

Senecio aureus var. *borealis* A. Gray, Pl. Wright. **1**: 125. 1852; not T. & G. 1843; *S. aureus* var. *compactus* A. Gray, Syn. Fl. 1^2: 391; in part.

Perennial with a branched caudex, in age perfectly glabrous, or slightly floccose at the base of the leaves: stems very slender, about 3 dm. high: basal leaves very narrowly oblanceolate, thick with a slender petiole, slightly 3-toothed at the apex or wholly entire, 4–8 cm. long and 4–5 mm. wide: stem leaves linear and subentire: cyme open and corymbiform: heads 7–8 mm. high: bracts lanceolate, acute ⅔ or ¾ as long as the disk: rays light yellow, about 8 mm. long and 1–1.5 mm. wide, 3-nerved; achenes hispid-puberulent on the angles.

This species differs, from the preceding in the slender stem and the open cyme, and also in the form of the leaves. The latter character also separates it from the next following. It grows in wet sandy soil. The type was growing at an altitude of 2400 m. Wright's specimens are past blooming, and good characters could not be taken from them, wherefore I have made Sheldon's specimens the type. The latter were mixed with some of the next. [Plate 5, f. 12.]

COLORADO: Cottonwood Creek, Buena Vista, 1892, *C. S. Sheldon* (type in the herbarium of N. Y. Botanical Garden).

TEXAS: Mountains beyond the Limpia, 1849, *Wright, 403.*

8. **Senecio oblanceolatus** sp. nov.

Perennial with several stems from a strong root, in age glabrous or rarely slightly floccose at the base of the leaves: stems short and stout, about 2 dm. high: basal leaves oblanceolate, thick and fleshy, 4–6 cm. long, obtuse, crenate with entire long tapering bases or the first subentire: stem leaves similar or reduced and linear in outline: cyme corymbiform, not compact: heads about 8 mm. high; bracts linear acute, yellowish green; the calyculate ones minute and few: rays 5–6 mm. long and about 1.5 mm. wide, 4-nerved: achenes minutely scabrous on the angles.

This species has also been included in *S. aureus compactus*, but lacks the dense inflorescence of *S. compactus* as here understood. The stem leaves never show any indication of being pinnatifid with narrow lobes as in that species. *S. compactus* is a plant of the Great Plains, while *S. oblanceolatus* is a mountain plant growing at an altitude of 1800–3000 m. [Plate 5, f. 9.]

COLORADO: Como, South Park, 1895, *C. S. Crandall* (type in the herbarium of N. Y. Botanical Garden); El Paso County, 1897, *A. A. & E. Gertrude Heller, 3508;* Cottonwood Creek, Buena Vista, 1892, *C. S. Sheldon.*

9. **Senecio longipetiolatus** sp. nov.

A tall, simple, perfectly glabrous perennial, with a short erect rootstock: stem strict, 3–6 dm. high, terete: basal leaves oblanceolate, 1–1.5 dm. long, with a slender petiole, from serrate to subentire: lower stem leaves similar; the upper reduced, lanceolate, sessile, sharply serrate, or laciniate-dentate, often auricled at the base: cyme dense, corymbiform: heads 8–9 mm. high: bracts about 20, linear, acute: the calyculate ones few, minute, subulate and crisp: rays dark orange, 4–7 mm. long and 1.5 mm. wide, 3–4-nerved: achenes strongly angled, glabrous.

In the type the basal leaves are strongly serrate, but in the Colorado plants they are indistinctly so or subentire. Baker, Earle & Tracy's specimens were named by Professor Greene, *Senecio crocatus* Rydb. but it is entirely distinct from anything collected by Hall & Harbour, and has nothing that fits any description of *S. aureus* var. *croceus*, except the dark rays. See further remarks under *S. crocatus. S. longipetiolatus* grows at an altitude of 2000–3000 m. [Plate 6, f. 10, 10a.]

WYOMING: Spread Creek, Teton Forest Reserve, 1897, *F. Tweedy, 585* (type in the herbarium of N. Y. Botanical Garden).

COLORADO: Medicine Bow Range, 1891, *C. S. Crandall;* Hamor's Lake, north of Durango, 1898, *Baker, Earle & Tracy, 625.*

10. **Senecio fulgens** sp. nov.

Simple and glabrous perennial with a very short caudex: stem about 3 cm. high: basal leaves oblanceolate, thick and somewhat fleshy, with the petiole about 5 cm. long, dentate or subentire: lower stem leaves spatulate with a winged petiole, coarsely dentate; upper stem leaves sessile with an auricled base, lobed with triangular or triangular lanceolate lobes, acute: cyme corymbose and rather dense: heads about 8 mm. high: bracts about 15, oblong, acute, with a broad membranous margin; the calyculate ones few, lanceolate: achene striate, glabrous: rays 4–5 mm. long and 2 mm. wide, dark orange.

Closely related to the preceding, but differing in the short basal leaves and the lobed upper stem leaves and also in the fewer and broader bracts. It grows at an altitude of about 2700 m. [Plate 6, f. 13.]

WYOMING: Grand Creek, Teton Forest Reserve, 1897, *F. Tweedy, 584* (type in the herbarium of N. Y. Botanical Garden).

11. SENECIO CROCATUS Rydb. Bull. Torr. Club, **24**: 299. 1897
Senecio aureus var. *croceus* A. Gray, Proc. Acad. Nat. Sci. Phila. **1863**: 68, 1863; not *S. croceus* DC. 1837.

When the above name was published I did not know that this variety of Gray's was a complex one. Hall & Harbour's no. *332*, which is the type, consists of two different things; but as one of them is rayless it can not be taken as the type of the var. *crocatus*, which was named from its orange rays. That I did not draw a new diagnosis, I admit, was perhaps careless, but this blunder I think was not worth a page and a half of discussion as it was given by Professor Greene in Pittonia, **4**: 114–116. I committed just the same mistake as Professor Greene himself in establishing *Antennaria media* Greene, Pittonia, **3**: 286. What Professor Greene says of Mr. E. Nelson in Pittoria, **4**: 85 can be applied to himself. Gray's description of the var. *croceus* in the Proceedings of the Philadelphia Academy is perhaps not adequate, but this description is supplemented in the Synoptical Flora and elsewhere and I think that *Senecio aureus* var. *croceus* Gray is amply published according to all rules we have. If so, *Senecio croceus* Rydberg is not a nomen nudum, whatever Professor Greene may say. Professor Greene in 1897 or 1898 accepted my name, for he named Baker, Earle &

Tracy, no. 625, *S. crocatus* Rydberg. This mistake is just as unpardonable because that plant shows none of the characters, assigned to *S. aureus* var. *croceus* Gray, except the color of the rays, and this character Professor Greene, agrees with me in regarding as of little value. That Professor Greene and other botanists may know what I now mean by *S. crocatus* I shall give a diagnosis, here following Professors Greene's example in the case of *Antennaria media*.

A glabrous perennial with a short erect rootstock: stem 1.5–3 dm. high: basal leaves 2-3 cm. long, obovate or spatulate, crenate or subentire with a winged petiole: lower stem leaves similar but with broader, winged petioles which are somewhat auricled at the base, or else oblong without distinction between blade and petiole and then more auricled: upper stem leaves ovate or triangular with very large and large-toothed auricles: cyme small and compact with 2–5 mm. heads, which are 8–10 mm. high: bracts about 20, linear: rays 7–8 mm. long and 1.5–2 mm. wide, orange to pale yellow, achenes striate, glabrous. [Plate 5, f. 13.]

COLORADO: Middle Park, 1862, *Hall & Harbour*, *332*, in part (type); *329*, in small part; 1868, *Geo. Vasey* (Powell's Expedition), *340 B*; South Cottonwood Gulch, 1892, *C. S. Sheldon*; Gray's Peak, 1872, *John Torrey*; (?) Little Kate Mine, 1898, *Baker, Earle & Tracy*, *569*;* South Park, 1871, *Canby*; Long's Peak, 1886, *Letterman* (depauperate).

WYOMING: La Plata Mines, 1895, *Aven Nelson*, *1769*.

SENECIO DIMORPHOPHYLLUS Greene, Pittonia, **4**: 109. 1900

I have not seen any specimens of this species, and have not been able to include it in the key. It is described as being a foot (about 3 dm.) high, light green and with long golden-yellow rays. Otherwise the description reads much like that given above for *S. crocatus*. The type was collected about Pagosa Peak, Colo., in 1899, by C. F. Baker.

12. SENECIO CYMBALARIOIDES Nutt. Trans. Am. Phil. Soc. II., **7**: 412. 1841

Senecio aureus borealis Torr. & Gray, Fl. **2**: 442. 1843; *S. aureus obovatus* Eat. King's Exp. **5**: 190, in part. 1871.

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*These specimens were named *Senecio heterodoxus* Greene n. sp., but I can not find any published description. They differ from the rest in being cespitose, with less marked differentiation in the leaves and with traces of floccose pubescence at the bases of the leaves and heads. The species may be distinct.

This has sometimes orange rays and has then been confused with *S. crocatus*, but it lacks the winged petioles of the lower leaves and the large auricles of the upper. It often reaches a height of 3 dm. and then many of the stem leaves are also spatulate. Such a form with more permanent woolliness is Watson's no. 669; otherwise I cannot distinguish it from *S. cymbalariodes*. [Plate 5, f. 1.]

BRITISH AMERICA: Mackenzie River, 1861–2, *I. S. Onion.*

MONTANA: Park Co., 1887, *Tweedy, 343*, in part; Silver Bow Co., *Mrs. Moore;* Jack Creek, 1897, *Rydberg & Bessey, 5266.*

WYOMING: Beaver Cañon, 1895, *Rydberg;* Bacon Creek, 1894, *Aven Nelson, 906.*

IDAHO: Mt. Chauvet, 1897, *Rydberg & Bessey, 5267.*

UTAH: Wasatch Mts., 1869, *S. Watson, 669.*

WASHINGTON: Mt. Paddo, 1882, *W. N. Suksdorf;* Columbia, *Nuttall* (type).

13. **Senecio Jonesii** sp. nov.

A glabrous perennial: stem about 3 dm. high, slender, terete: basal leaves rounded-obovate, sinuately toothed, sometimes with a pair of small lobes at the base; their petioles often tinged with red: stem leaves oblanceolate in outline, pinnatifid with oblong segments, generally short-petioled: cyme corymbiform: heads about 8 mm. long: bracts 12–15, lanceolate, acuminate, about 2/3 as long as the disk, membranous margined; calyculate ones few, linear: rays about 5 mm. long and 2 mm. wide, 4-nerved: achenes very strongly striate, glabrous.

Nearly related to the preceding, but differing in the toothing of the leaves and the form of the bracts. The type was collected at an altitude of 3300 m. [Plate 6, f. 5.]

UTAH: Alta, Wasatch Mountains, 1879, *M. E. Jones, 1125* (type in the Columbia Herbarium).

14. **Senecio subcuneatus** sp. nov.

Perennial with a branched caudex, slightly floccose when young, glabrate in age: stems 3–4 dm. high: basal leaves about 5 cm. long, spatulate or cuneate, dentate or serrate above the middle, entire at the base and tapering into a short petiole, rather thick: lower stemleaves narrowly cuneate, short-petioled, dentate at the apex: upper ones linear and sessile, often sharply dentate: cyme corymbiform: heads about 8 mm. high: bracts about 15, lanceolate, acute, shorter than the disk: rays 4–5 mm. long and 1.5 wide, 4-nerved: achenes striate, glabrous.

This species is nearest related to *S. cymbalarioides* but is taller, with narrower basal leaves, which have sharper teeth; the heads are also much more numerous. It grows at an altitude of 2000–2500 m. Baker, Earle and Tracy's specimens were labeled by Prof. Greene *Senecio Fendleri*, approaching *S. compactus*. This is strange from one that claims that he has known *S. Fendleri* since 1870.* This plant has little in common with that species or with *S. Nelsonii* Rydb. [Plate 5, f. 6.]

COLORADO: Grizzly Creek, 1896, *C. F. Baker* (type in the herbarium of N. Y. Botanical Garden); Lake City, 1878, *H. W. Pease* (depauperate); Mancos, 1898, *Baker, Earle & Tracy, 63*.

15. **Senecio acutidens** sp. nov.

Perennial, with a thick woody rootstock and short caudex, in age glabrate or slightly floccose at the base of the leaves: stems several, about 2 dm. high, angled, more or less tinged with red: basal leaves about 5 cm. long, thick, fleshy and somewhat glaucous, obovate or spatulate: sharply dentate above the middle, at the base entire and abruptly contracted into a slender petiole: lower stem leaves similar or oblanceolate and acute; the upper reduced, linear, laciniate-dentate or somewhat pinnatifid: cymes corymbiform and rather dense: heads 8–10 mm. high: bracts broadly linear, acute, ⅔ or ¾ as long as the disk: rays about 5 mm. long and 1.5 mm. wide, 3–4-nerved: achenes slightly angled, glabrous.

Nearest related to *S. cymbalarioides* but the leaves are thicker, more glaucous and very acutely dentate. The perennial rootstock and caudex are also thicker and more woody. [Plate 5, f. 2.]

WYOMING: Union Pass, 1894, *Aven Nelson, 858* (type in the herbarium of N. Y. Botanical Garden).

16. SENECIO PSEUDAUREUS Rydberg, Bull. Torr. Club, **24**: 298. 1897

This is nearest related to the eastern *S. aureus* and has the same subcordate, thin, basal leaves, but these are distinctly serrate, instead of crenate. It is the most common species of the group in the Rockies, growing in wet meadows at an altitude of 1000–3000 m. [Plate 5, f. 10.]

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* See Pittonia, 4: 112.

MONTANA: Little Belt Mountains, 1896, *Flodman, 918* (type); Madison Co., *Mrs. McNulty*; Bear Gulch, 1887, *F. Tweedy, 340*; Columbia Falls, *Mrs. Kennedy, 9*; Spanish Basin, 1897, *Rydberg & Bessey, 5263*; Indian Creek, *5264*.

WYOMING: Lone Star Geyser Basin, Yellowstone Park, 1897, *Rydberg & Bessey, 5262*.

COLORADO: Grizzley Creek, 1896, *C. F. Baker*; Long's Peak, 1886, *G. W. Letterman*; Mancos, 1898, *Baker, Earle & Tracy, 45*.

NEW MEXICO: Pecos River, 8 miles east of Glorietta, 1897, *A. A. & E. Gertrude Heller, 3682*.

UTAH: E. Humbolt Mts., 1868, *S. Watson, 667*.

17. **Senecio platylobus** sp. nov.

S. aureus var. *croceus* D. C. Eaton, King's Exp. **5**: 190, in part. 1871; not Gray. 1863.

A stout, perfectly glabrous perennial: stem about 4 dm. high, rather leafy, striate and somewhat angled: basal leaves 6–10 cm. long, slender-petioled, obovate or broadly oval, sinuately crenate-dentate, thin: lower stem leaves oblanceolate, petioled, deeply lobed or divided with rounded lobes: upper stem leaves broadly ovate in outline, sessile, pinnately divided into broadly oblong or cuneate divisions which are more or less deeply sinuate-dentate: cyme compound; its branches corymbiform: heads about 8 mm. high; bracts broadly lanceolate, acute, membranous margined and slightly shorter than the disk: rays 6–7 mm. long, and 3 mm. wide, 5-nerved: achenes striate, glabrous.

Probably nearest related to the preceding, but easily distinguished by the form of the leaves and the broad rays. It grows at an altitude of about 1500 m. [Plate 6, f. 8.]

UTAH: Wasatch Mountains, 1869, *S. Watson, 671* (type in the Torrey Herbarium).

18. **Senecio flavovirens** sp. nov.

S. Balsamitae Rydberg, Mem. N. Y. Bot. Gard., **1**: 446, mainly; 1900; not Muhl. 1804.

Light or yellowish green, slender, perennial, in age glabrate or slightly floccose at the base of the leaves: stem 3–4 dm. high, striate, pale: basal leaves 3–8 cm. long, obovate or broadly oval, generally tapering into the petioles, but sometimes truncate at the bases, obtuse, crenate or sinuate, light green: lower stem leaves oblanceolate in outline and petioled; the upper lanceolate or linear in outline and sessile; all deeply pinnatifid with narrow, oblong or linear segments: cymes contracted, corymbiform: heads 7–8 mm. high; bracts linear, acute, yellowish-green, and occasionally with brownish tips, a little shorter than the disk; calyculate ones few, linear, small and crisp: rays pale yellow, about 6 mm. long and 1.5 mm. wide, 4-nerved, or very often lacking: achenes hispid-puberulent on the angles.

Nearest related to the eastern *S. Balsamitae*, but characterized by its yellowish green color and a more contracted cyme. It grows at an altitude of 2000–3000 m. [Plate 5, f. 4.]

IDAHO: Beaver Cañon, 1895, *Rydberg* (type in the herbarium of N. Y. Botanical Garden).

MONTANA: Deer Lodge, 1895, *Rydberg, 2850* (rayless); Helena, 1887, *F. D. Kelsey, 501.*

WYOMING: Buffalo Fork, 1897, *Tweedy, 586;* Laramie Plains, 1889, *E. L. Greene* (rayless); Green River, 1894, *Aven Nelson, 1036* (rayless).

19. **Senecio aurellus** sp. nov.

Perennial with a short rootstock, somewhat floccose when young, soon glabrate: stem striate, 4–5 dm. high: basal leaves spatulate or cuneate, dentate-serrate, about 5 cm. long, with a short petiole, soon glabrous: lower stem leaves long-petioled, cuneate or spatulate, lyrately lobed, the upper narrowly oblanceolate and subsessile, slightly auricled at the base: cyme compound but with rather few heads, which are about 8 mm. high: bracts 12–16, glabrous, yellowish-green, lanceolate, thin; calyculate ones minute, lanceolate: rays golden-yellow, 5–6 mm. long and 2 mm. wide, 4-nerved: achenes scabrous hispidulous on the angles.

In the form of the stem leaves this most resembles, perhaps, *S. rosulatus*, but these are thinner and perfectly green, only slightly floccose when young. Otherwise it is intermediate between the eastern *S. Balsamitae* and *S. multilobatus.* The type was determined by Professor Greene as "*S. pseudaureus* Rydb., not typical." To that species it does not have any close relationship. [Plate 6, f. 12, 12a.]

COLORADO: Mancos, 1898, *Baker, Earle & Tracy, 998* (type in the herbarium of New York Botanical Garden).

20. SENECIO NEPHROPHYLLUS Rydberg, Mem. N. Y. Bot. Garden, 1: 446. 1900

Related to the two preceding, but characterized by the rayless heads, the reniform first basal leaves which resemble those of *Oxyria digyna*, and the pinnatifid stem leaves with their oblong blunt segments. The Colorado specimens are much lower than the type, being about 2 dm. high. [Plate 6, f. 15.]

MONTANA: Big Blackfoot River, 1883, *Canby, 203*.

COLORADO: South Park, 1872, *T. C. Porter;* Middle Park, *Hall & Harbour, 332*, in part.

21. **Senecio Idahoensis** sp. nov.

Stout perennial, in age glabrate or slightly floccose at the base of the leaves: stem 4–5 dm. high, branched, striate, tinged with purplish: basal leaves obovate, serrate: lower stem leaves oblanceolate in outline, about 1 dm. long, petioled; the upper ovate or lanceolate in outline, sessile and auricled at the base; all bluish-green, pinnately divided into oblong or oblique-cuneate incised segments: heads numerous, about 1 cm. high; bracts about 25, very narrowly linear, equaling the disk: rays none: achenes striate, glabrous.

A species somewhat related to *S. aureus*, but characterized by its broad and laciniate leaves, rayless heads and numerous very narrow bracts. [Plate 6, f. 5.]

IDAHO: Granite Station, 1892, *Sandberg, McDougal & Heller, 803* (type in the N. Y. Botanical Garden herbarium).

22. SENECIO PAUCIFLORUS Pursh, Fl. Am. Sept. 529. 1814

This species, characterized by its few (2–6) rayless heads, linear purple tinged bracts, equaling the disk in length, and its small rounded-oval crenate basal leaves, has been collected several times in Labrador; but exactly similar specimens are in the Torrey herbarium and were collected by Burke in the Rocky Mountains, but the locality is not given. [Plate 5, f. 3.]

23. **Senecio fedifolius** sp. nov.

A delicate glabrous perennial with a very short caudex and a clump of fibrous roots: stem slender, weak, about 1.5 dm high: basal leaves 3–5 cm. long with a slender petiole; blade 1–2 cm. long, rounded-ovate or broadly oval, wavy or subentire: stem leaves mostly small, pinnately divided into short oblong segments: heads 2–3, about 6 mm. high, somewhat turbinate; bracts 12–15, broadly lanceolate, conspicuously membraneous margined: rays none: achene glabrous.

The species is named from the resemblance the basal leaves have to those of certain species of *Valerianella* which genus has also been known under the name *Fedia*. [Plate 5, f. 7.]

COLORADO: South Park, 1871, *W. M. Canby* (type in the herbarium of the College of Pharmacy, New York).

SUBNUDI

A slender perennial with a long slender horizontal rootstock, perfectly glabrous, sparingly leafy, monocephalous: basal leaves broadly obovate, coarsely crenate-dentate: heads decidedly turbinate with narrow linear-acuminate bracts; calyculate bracts, if present, few, and half as long as the main series. A single species.

24. SENECIO SUBNUDUS DC. Prod., **7**: 428. 1837

Senecio aureus var. *subnudus* Gray, Syn. Fl. **1**^{2}: 391. 1884.

This species has been included as a variety of *S. aureus*, but I think it should be regarded as the type of a distinct group. The long slender horizontal rootstock and the decidedly turbinate involucre is not found in any of the *aureus* allies. The latter characters would place it near *S. frigidus*. [Plate 6, f. 2.]

WASHINGTON: Chiquash Mountains, 1892, *Suksdorf, 2167*; Cascade Mountains, 1882, *Brandegee, 118*.

OREGON: 1882, *T. Howell*; 1871, *Elihu Hall, 304*.

CALIFORNIA: Butterfly Valley, 1874, *Mrs. R. M. Austin*.

MONTANA: Park Co., 1887, *Tweedy, 344*; Pony, 1897, *Rydberg & Bessey, 5270*.

WYOMING: Wind River, 1842, *Fremont*; Buffalo Fork, 1897, *Tweedy, 587*; Yellowstone Park, 1884, *Tweedy, 120*.

TOMENTOSI

Perennials, over 2 dm. high, with a short caudex or rootstock, which often is subligneous and cespitose, floccose when young, becoming more glabrate in age, but with some wool always remaining: basal leaves, except the very first ones, from serrate or dentate to pinnatifid: stem leaves always present, but often reduced, generally pinnatifid or pinnately lobed or toothed: heads cymose, small, with few and very small calyculate bracts.

The group is closely related to the AUREI and LOBATI with which it is connected through *S. Plattensis* and *S. Fendleri* respectively. *S. Nelsonii* and *S. multilobus* in young state may also be sought here.

- Basal leaves mostly dentate or crenate.
  - Basal leaves suborbicular, ovate or cordate; margins of the petioles arachnoid-tomentose. 25. *S. flavulus.*
  - Basal leaves obovate or spatulate.
    - Lower stem leaves acute; plant dark green. 26. *S. Plattensis.*
    - Lower stem leaves obtuse; plant yellowish-green. 27. *S. Neo-Mexicanus.*
  - Basal leaves lanceolate or oblanceolate.
    - Basal leaves narrowly oblanceolate, serrate. 28. *S. salicinus.*
    - Basal leaves lanceolate, sinuate-dentate. 29. *S. canovirens.*
- Some of the basal leaves entire or dentate, the rest pinnatifid or pinnately lobed.
  - Plant conspicuously rosulate-stoloniferous; stem leaves sinuately round-lobed. 30. *S. rosulatus.*
  - Plant not stoloniferous; stem leaves pinnatifid with toothed lobes. 26. *S. Plattensis.*
- All leaves pinnatifid with toothed segments.
  - Caudex subligneous; plant tomentose; bracts shorter than the disk. 31. *S. Fendleri.*
  - Caudex not subligneous; plant glabrate.
    - Bracts almost equaling the disk. 5. *S. Nelsonii.*
    - Bracts much shorter than the disk. 4. *S. multilobus.*

25. SENECIO FLAVULUS Greene, Pittonia, **4**: 108. 1900

I have seen no specimens of this species, but from the description it must be most nearly related to the next, differing in the more slender habit, the small leaves and their form and the peculiar arachnoid tomentum on the margins of the petioles. The type was collected by C. F. Baker at Aboles, Colo., in 1899.

26. SENECIO PLATTENSIS Nutt. Trans. Am. Phil. Soc. II. **7**: 413. 1841

This species is exceedingly variable as to the leaf form as well as to the pubescence; usually the basal leaves are merely serrate and obovate or oval in outline, but sometimes some of them are like the lower stem leaves, more or less lyrately pinnatifid. It is conspicuously floccose when young, but in age the leaves become almost glabrous and the wool remaining only on the lower part of the stem and petioles. The species belongs to the region of the plains. [Plate 6, f. 14.]

SOUTH DAKOTA: Brookings, 1897, *L. W. Carter;* Hot Springs, 1892, *P. A. Rydberg, 828.*

COLORADO: Fort Collins, 1895, *C. S. Crandall.*

INDIAN TERRITORY: Sapulpa, 1895, *B. F. Bush, 1249;* False Washita, 1868, *Edw. Palmer, 461.*

KANSAS: Riley Co., 1895, *J. B. Norton, 303;* Manhattan, 1887, *W. A. Kellerman;* Osborn Co., 1894, *C. L. Shear, 28;* Fort Riley, 1892, *E. E. Sayle, 452.*

NEBRASKA: Lincoln, 1887, *H. J. Webber;* Fort Niobrara, 1888, *T. E. Wilcox; Mrs. Austin;* Creete, *G. D. Sweezey.*

MISSOURI: St. Louis, 1843, *Riehl;* McDonald Co., 1891, *B. F. Bush.*

ILLINOIS: Oquawka, 1873, *H. N. Patterson.*

27. SENECIO NEO-MEXICANUS A. Gray, Syn. Fl. **1**^{2}: 392. 1884

The original publication of this species is generally given as Proc. Amer. Acad. **19**: 55, but no description is there to be found. As far as I can find, the one in the Synoptical Flora is the first published. Probably more than one species is included in that description and in the specimens cited below there are apparently three different types, but it has been impossible for me to find any constant characters by which to distinguish them. In one of them the stem leaves are more or less lyrate-pinnatifid and even the basal ones occasionally have a few lobes on the petiole, while in the others the stem leaves are narrow and merely toothed. The tomentum is sometimes deciduous, sometimes almost persistent. It grows at an altitude of 1200–2500 m. [Plate 6, fig. 7.]

NEW MEXICO: Silver City, Pinos Altos Mts., 1880, *E. L. Greene;* between Santa Fe and Canoncito, 1897, *A. A. & E. Gertrude Heller, 3749;* Organ Mts., 1895, *E. O. Wooton; P. V. LeRoy.*

ARIZONA: Fort Huachuca, 1892, *T. E. Wilcox;* 1876, *E. Palmer, 614;* Santa Catalina Mts, 1883, *C. G. Pringle;* San Francisco Mts., 1881, *H. H. Rusby, 212;* Mogollon Mts., 1887, *E. A. Mearns, 58;* Squaw Creek, 1887, *E. A. Mearns, 171;* Santa Rita Mts., 1881, *C. G. Pringle.*

28. **Senecio salicinus** sp. nov.

A floccose perennial, with a short cespitose caudex: stems several, about 4 dm. high, simple below, striate and floccose: basal leaves 5–10 cm. long, narrowly oblanceolate, the first ones subentire, but most of them serrate except at the tapering base, finely tomentose on both sides, but in age more glabrate above: stem leaves small, linear, sessile, dentate, slightly auricled at the base: cyme compound: the heads subumbellate at the ends of the branches, 7–8 mm. high, slightly floccose at the base: bracts yellowish, thin, lanceolate, shorter than the disk: rays light yellow, short and broad, 3–4 mm. long and 2 mm. wide: achenes striate, glabrous.

A species related to *S. Fendleri*, but characterized by the narrow, merely serrate basal leaves, the small subumbellate heads in a short, flat-topped inflorescence with widely spreading ultimate branches. It grows in the foothills at an altitude of about 1800 m. [Plate 6, f. 6.]

COLORADO: J. Laramie Co., 1895, *J. H. Cowen* (type in the herbarium of N. Y. Botanical Garden).

29. **Senecio canovirens** sp. nov.

Stout perennial with a short erect rootstock, dark green, floccose with more or less deciduous wool: stem 4–5 dm. high, loosely floccose: basal leaves 5–12 cm. long, short-petioled; blades lanceolate or oblanceolate, sinuately toothed, dark green, firmly floccose, in age almost glabrate above: lower stem leaves similar; upper ones linear, sinuately dentate with rather acute teeth: cyme with erect or ascending branches: heads 7–8 mm. high, turbinate campanulate; bracts 12–14, oblong, linear, floccose at the base and more or less villose, acute, brownish on the back and with yellowish margins: rays 5–6 mm. long and 2 mm. wide, at first orange, in age paler, 4-nerved: achenes glabrous, striate.

The type was determined by Prof. Greene as *Senecio Fendleri*, but it is very unlike the typical form of the aggregate that has been known under that name. The dark green color, the leaves which are merely toothed, never pinnatifid and still less bipinnatifid as they often are in *S. Fendleri* easily distinguish it from that species. The perennial caudex and rootstock are similar to that of *S. Fendleri* but less thick and less woody and, as far as seen from the specimens, not branched. It grows at an altitude of about 2000 m. [Plate 6, f. 9.]

NEW MEXICO: White Mountains, 1897, *E. O. Wooton*, *244* (type in the herbarium of N. Y. Botanical Garden); Organ Mountains, *493*.

COLORADO: Pike's Peak, 1895, *Mrs. S. L. Clarke.*

SENECIO MUTABILIS Greene, Pittonia, **4**: 113. 1900

As I have seen no specimens of this species I have not been able to include it in my key. It may be the same as the preceding, but several characters given in the description do not agree with it, especially the deeply tridentate rays. Professor Greene is always criticizing other botanists for drawing vague descriptions. No better example of just such a description can be given than the one here made by himself.

30. **Senecio rosulatus** sp. nov.

Senecio aureus var. *Balsamitae* A. Gray, Proc. Acad. Nat. Sci. Phila. **1863**: 68, in part.

More or less tomentose perennial, with a branched rootstock and generally numerous underground stolons producing leafy offsets: stems 2–3 dm. high, floccose or sometimes becoming almost glabrate in age; first leaves of the offsets spatulate and entire; other basal leaves and lower stem leaves oblanceolate, finely white tomentose especially on the lower surface, occasionally becoming more glabrate in age, sinuately pinnatifid with rounded lobes, petioled: upper stem leaves lanceolate or linear, sessile, auricled at the base also with rounded lobes: cyme corymbiform, open: heads small, 5–6 mm. high, floccose at the base: bracts about 12, broadly lanceolate, acute, yellowish with rather broad membranous margins, much shorter than the disk: rays about 5 mm. long and 2 mm. wide, 4–5-nerved: achenes strongly striate, glabrous.

The species has been confused with *S. Fendleri*, but is distinguished by the more slender rootstock and the numerous branches forming offsets, the entire first leaves not seen in that species and the short rounded entire lobes of the stem leaves. The heads are usually also smaller. It grows at an altitude of 2500–4000 m. [Plate 6, f. 4, 4a.]

COLORADO: Georgetown, 1885, *N. H. Patterson 79* (type); Golden City, 1892, *E. L. Greene;* 1862, *Hall & Harbour, 333*, in part; 1871, *W. M. Canby;* Twin Lakes, 1873, *J. M. Coulter;* Pike's Peak, 1884, *G. W. Letterman, 260;* Caribou, 1891, *E. Penard, 228;* Fort Collins, 1896, *C. F. Baker;* Silver Plume, Gray's Peak, and Georgetown, 1895, *P. A. Rydberg.*

31. SENECIO FENDLERI Gray, Mem. Am. Acad. II, **4**: 108. 1849

The typical *S. Fendleri* is a rather rare plant with a decidedly woody rootstock and caudex. None of the specimens seen show any sign of entire leaves nor of subterranean stolons. The leaves are often bipinnatifid or pinnatifid with oblong toothed, and acutish segments. See also the remarks given under *S. Nelsonii.* [Plate 6, f. 3.]

NEW MEXICO: Santa Fe Cañon, 1897, *A. A. & E. Gertrude Heller, 3774.*

COLORADO: 1873, *Brandegee, 546.*

UTAH: Salt Lake City, 1869, *S. Watson.*

Explanation of Plates

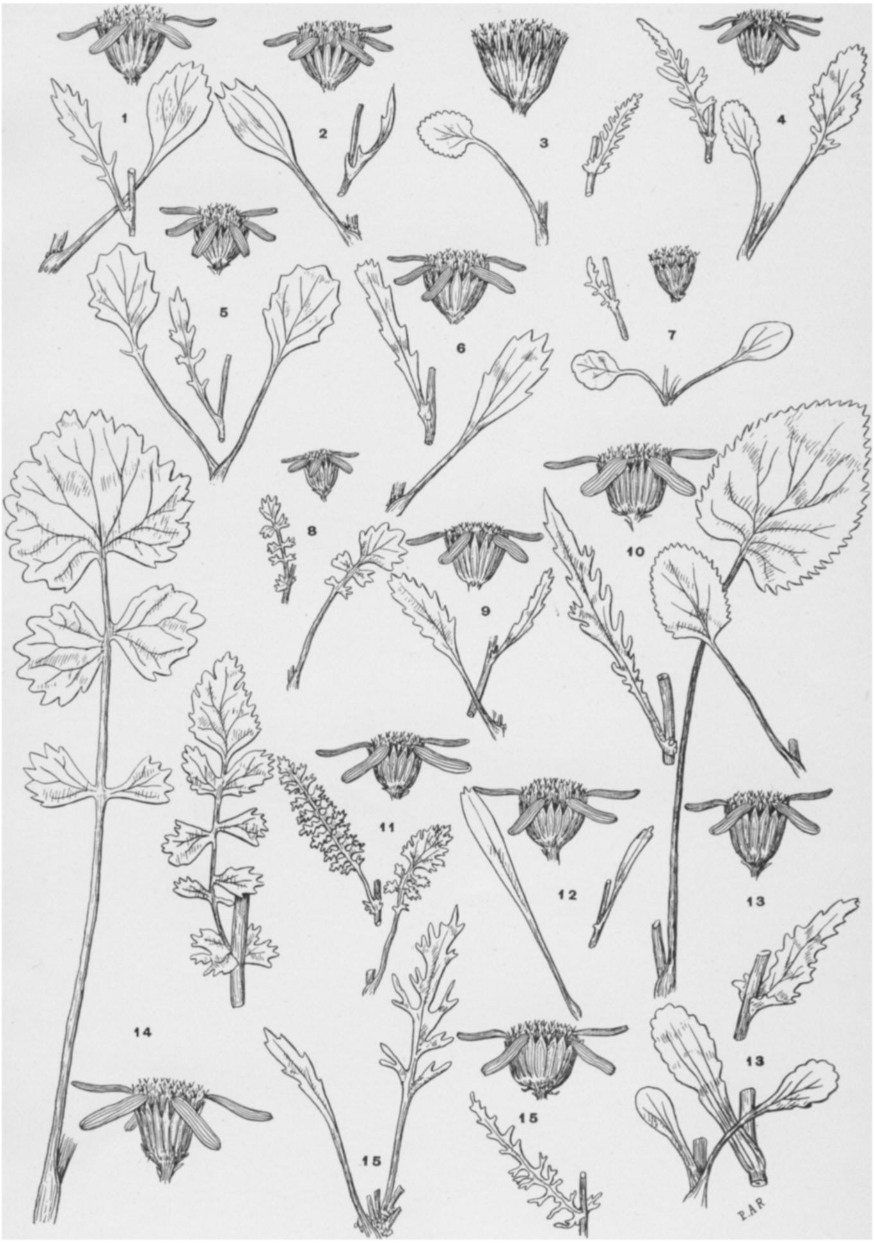
Unless otherwise stated, the drawings represent basal leaf, stem leaf selected a little above the middle of the stem and the head of each species. The leaves are reduced to one half and the heads are of natural size.

PLATE 5

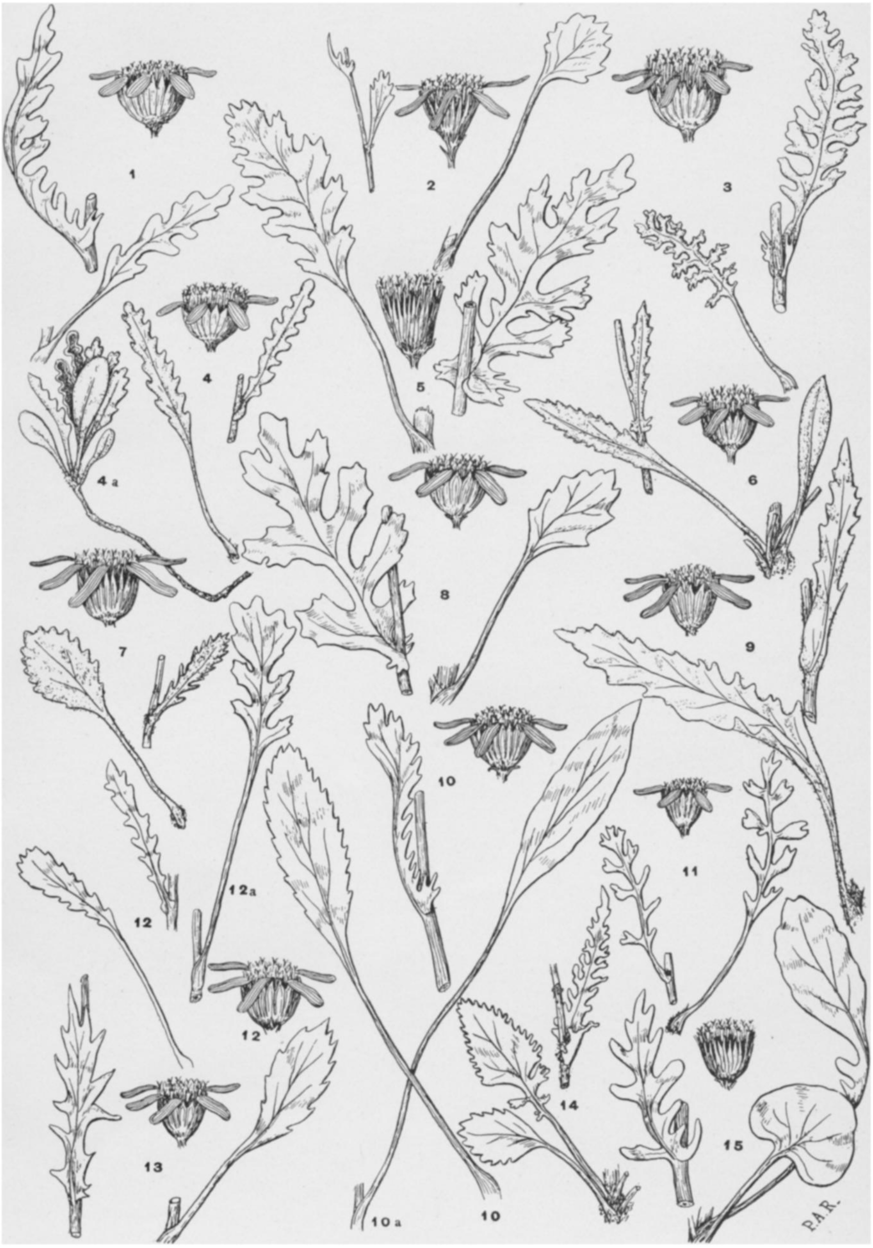
1. *S. cymbalarioides* Nutt.
2. *S. acutidens* Rydb.
3. *S. pauciflorus* Pursh.
4. *S. flavovirens* Rydb.
5. *S. Jonesii* Rydb.
6. *S. subcuneatus* Rydb.
7. *S. fedifolius* Rydb.
8. *S. Greggii* Rydb.
9. *S. oblanceolatus* Rydb.
10. *S. pseudaureus* Rydb.
11. *S. millelobatus* Rydb.
12. *S. tridenticulatus* Rydb.
13. *S. crocatus* Rydb.
14. *S. sanguisoiboides* Rydb.
15. *S. compactus* (A. Gray) Rydb.

PLATE 6

1. *S. Nelsonii* Rydb.
2. *S. subnudus* DC.
3. *S. Fendleri* A. Gray.
4. *S. rosulatus* Rydb.
4*a*. An offset of the same.
5. *S. Idahoensis* Rydb.
6. *S. salicinus* Rydb.
7. *S. Neo-Mexicanus* A. Gray.
8. *S. platylobus* Rydb.
9. *S. canovirens* Rydb.
10. *S. longipetiolatus* Rydb. (from type).
10*a*. Basal leaf from *Baker, Earle & Tracy, 625.*
11. *S. multilobatus* Torr. & Gray.
12. *S. aurellus* Rydb.
12*a*. Lower stem leaf of the same.
13. *S. fulgens* Rydb.
14. *S. Plattensis* Nutt.
15. *S. nephrophyllus* Rydb.



RYDBERG ON SENECIO.



RYDBERG ON SENECIO.